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A N
E S S A Y,
Concerning the CAUSE of the
ENDERMIAL COLIC
O F
DEVONSHIRE,

Which was read in the THEATRE of the
COLLEGE of PHYSICIANS, in LONDON,
on the Twenty-ninth Day of JUNE, 1767,

BY GEORGE BAKER,

now of the COLLEGE of PHYSICIANS, and of the ROYAL
SOCIETY, and Physician to her MAJESTY's Household.

ἘΚ ΤΟΥΤΩΝ ΝΟΣΟΥΜΕΝ, ΟἷΣ ΚΑὶ ΖΩΜΕΝ.

PLUTARCH.

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M.DCC.LXVII.

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TO

Sir RICHARD WARWICK BAMFYLDE,
BARONET,

AND

JOHN PARKER, ESQUIRE,

THIS

E S S A Y,

ON A

SUBJECT PARTICULARLY INTERESTING
TO THE COUNTY, WHICH HAS THE
HAPPINESS OF BEING REPRESENTED
BY THEM IN PARLIAMENT,

IS,

WITH THE GREATEST RESPECT, INSCRIBED

BY

THEIR MOST OBEDIENT,

AND MOST HUMBLE SERVANT,

GEORGE BAKER.

AN
E S S A Y

Concerning the CAUSE of the

ENDEMIAL COLIC

OF

DEVONSHIRE.

A VERY small acquaintance with the writings of Physicians is sufficient to convince us, that much labour and ingenuity has been most unprofitably bestowed on the investigation of remote and obscure causes; while those, which are obvious and evident, *quæ ante pedes sunt*, which must necessarily be acknowledged as soon as stumbled upon, have
B been

been too frequently overlooked and disregarded. Such a spirit of investigation has, in several instances, been the parent of dangerous errors in practice ; inasmuch as Men are apt to be as partial to their own conceits, as to their own offspring ; and seldom forget opinions at the bed-side, which have been the result of much contemplation at home. It must however be acknowledged, that such a spirit is a fault not so much to be imputed to the present, as it was to the last age. We have now learned to attend to Nature ; to observe diseases, and the genuine effects of medicines on the human body ; and to make experiment the great *basis* of our reasoning. And although, in many cases, we subscribe to the doctrine of that sect of Physicians,

Physicians,

Physicians, who, according to Celsus, called themselves Ἐμπειρικός, *ab experientia*, that *non interfit quid morbum faciat, sed quid tollat*; yet we are not such Empirics, in the modern sense of the word, as to pay no regard to those causes, which are manifest and within our reach; such causes more especially, as lead us directly either to the cure of diseases, or to the prevention of them.

With respect to the provincial disease, which is the subject of this essay, I shall at present content myself with considering its origin. And if I am not mistaken in that, it would seem that, in this instance, *cognitio causæ morbum tollet*; that an obvious method is pointed out, by which this colic may become no longer an ende-

mial disease in one part of England ; and perhaps, in other parts, less frequent than it is at present. A malady, so formidable as well in its immediate effects, as in its more distant consequences, it is an office of humanity, as much as possible, to prevent. We may gain credit even in avoiding an enemy of superior force ; and when we find ourselves unequal to the contention, it is a kind of victory to make our escape, —

fallere & effugere est triumphus.

The earliest account of the Devonshire colic, which I have met with, is in Dr. William Musgrave's *Dissertatio de Arthritide Symptomatica*, published in the year 1703. In the fifth section of the tenth chapter *de Arthritide ex colicâ*, is the following passage. “ Alia
“ vero

“ vero colica, apud Damnonium, ex
 “ pomaceo immiti et acido, nimis
 “ usurpato, derivatur ; id quod ex eo
 “ liquet, siquidem illos solum infestat,
 “ qui potioni isti assuevere, eademque
 “ ratione qua sunt affueti : sic ut iis
 “ tempestatibus, quæ pomaceo abun-
 “ dant, crescat, & in vulgus ea grassetur ;
 “ contra vero, Pomona copiam
 “ negante, rarius obversetur.” It

seems very particular, that Dr. Musgrave should say so much of this colic, which is represented to be the effect of cyder ; and not mention those essential and pathognomonic symptoms, by which it is at this time distinguished. Are we to suppose that, when Dr. Musgrave lived, this species of colic had not been observed to terminate in palsy, or epilepsy ? Or is it more probable,

bable, that his attention was so engrossed by the general subject of his dissertation, that he forgot to mention such remarkable *phænomena*? That he was well acquainted with a disease exactly similar to Dr. Huxham's *morbis colicus Damnoniorum*, namely the colic of Poitou, is very certain; for in the fourth history of the same tenth chapter, he mentions the case of a gentleman, who “ ætatis flore, colica,
 “ quam Pictonicam appellant, ali-
 “ quamdiu vexatus, ex more et pro-
 “ gressu istius mali ordinario, incidit
 “ in paralyfin; artus exinde marcidos,
 “ graciles, ἀκίνητος habens; per reli-
 “ quum vitæ clinicus. Paralyfi sub
 “ ejus initium accesserunt dolores er-
 “ ratici, incerti, horum, illorum artuum
 “ internodia cruciantes, autumnio et
 “ tem-

“ tempestate pluvia maximopere sævi-
 “ entes, et ad amuffim rheumatismum
 “ fimulantes.”

It is indeed possible, that Dr. Musgrave might not often have seen the colic, which he mentions as peculiar to the drinkers of cyder; for, as I am informed, orchards were not in his time much cultivated in the country near Exeter, where Dr. Musgrave resided; and there was no county-hospital at that time established. And Dr. Huxham testified in the year 1739, that there was at that time ten times more cyder made and drunk in the County, than there had been about thirty or forty years before.

Dr. Huxham's *opusculum de morbo colico Damnoniorum*, which he first published in the year above-mentioned,

contains a very full description of the
malady, which is the subject of our
present inquiry. He informs us, that “ in
“ the beginning of the Autumn 1724,
“ it spread itself over all the county
“ of Devon, among the Populace
“ especially, and those who were not
“ very elegant and careful in their
“ diet; and that, though it may
“ not rage with the same degree of
“ violence, and may affect a vastly
“ less number of People, yet it infests
“ that County more or less every Au-
“ tumn.” Whoever peruseth Dr. Hux-
ham’s description, will readily de-
termine the *morbus colicus Damnonio-*
rum to be precisely the same disease,
which, in the year 1617, was described
by Francis Citois, a native of Poitiers,
afterwards Physician to the King of
France,

France, and to the Cardinal Duc de Richelieu, under the title of *novus & popularis apud Piſtones dolor colicus bilioſus*. Indeed it ſeems to be acknowledged by Dr. Huxham, that what is called *Colica Piſtonum*, “ which kind
 “ of diſeaſe,” ſays he, “ is very com-
 “ mon in the Weſt-Indies,” is ſimilar to the diſeaſe which he deſcribes;
 “ ariſing from a ſimilar cauſe, to wit,
 “ too * great an uſe of the very acid
 “ juice of lemons, and requiring much
 “ the ſame method of cure.”

Dr. Huxham refers the cauſe of the Devonſhire colic principally to a very groſs, eſſential, acid ſalt, or tartar, with which the expreſſed juice of ap-
 C ples,

* I am credibly informed, that, at this time, both in the Weſt Indies, and in the northern colonies of America, the juice of lemons and limes is not only much truſted to as the cure of this diſeaſe, but that it is even eſteemed to be a preſervative from it.

ples, whilst unfermented, abounds.
 He thinks that “ by long and frequent
 “ drinking a liquor of this kind, such
 “ a quantity of crude, gross tartar is
 “ thrown into the blood, that it
 “ thence becomes very acrid ; and
 “ not only the blood, but, from that
 “ impure source, all the humours
 “ thence secreted. So that instead of
 “ a very soft, lubricating *mucus* se-
 “ parated by the glands, discovered by
 “ Dr. Havers, we have as it were a
 “ sharp, coagulated matter, whence
 “ arises a great pain in the joints, and
 “ impotence of their motion.—In-
 “ stead of an exceeding soft lymph
 “ to moisten the nerves, a corrosive
 “ ichor ; and hence epileptical attacks.
 “ Moreover, the blood being saturate
 “ with such a great quantity of salts,
 “ they

“ they attract one the other strongly,
 “ and form greater *moleculæ* than can
 “ pass through the lymphatic ar-
 “ teries, scarce indeed through the fan-
 “ guineous capillaries; hence various
 “ obstructions, and great irritation on
 “ the nervous extremities. At length
 “ even the very Bile, that variously
 “ useful balsam of the body, becomes
 “ corrupted and quite enervated by the
 “ super-abundant apple-acid, though
 “ in its natural state it was designed
 “ to correct acidity *.”

Thus I have extracted a specimen
 of Dr. Huxham's doctrine; and for
 the remainder of his very ingenious
 theory I shall refer you to the treatise

* See Dr. Huxham's treatise on the Devonshire
 colic, translated from the Latin original, and pub-
 lished with the Doctor's approbation.

itself; where yon will find a sentiment, which perhaps is applicable on the present occasion.—“ Sine experientia
 “ vana omnis theoria, bella fit utcun-
 “ que.” For, notwithstanding the deference, which I always pay to the authority of this celebrated Physician, I have for some time conceived doubts concerning the solidity of this doctrine. When I have considered, that there is not the least analogy between the juice of apples, and the poison of lead; and that this colic of Devonshire is precisely the same disease, which is the specific effect of all saturnine preparations; it has not seemed to me at all probable that two causes, bearing so little relation to one another, should make such similar impressions on the human body. No author, whom I
 have

have had an opportunity of consulting, has given any intimation of having conceived the same suspicion with myself, except only the anonymous author (supposed to be M. Bouvart) of *Examen d'un livre qui a pour titre T. Tronchin de Colica Pictonum, par un Medecin de Paris*. This writer says, in a cursory manner, and without seeming to lay any stress on what he throws out, “ Il
 “ est possible, que les vins, dont parle
 “ Citois, et les cidres, dont parle M.
 “ Huxham, aient etè, sans qu'ils l'aient
 “ pu decouvrir, alterès avec la litarge,
 “ ou quelque autre matiere semblable.”

It is evident however from what this Author afterwards says, in the forty-sixth page, that he was very far from forming any settled opinion on this subject. “ Ces trois causes, sçavoir la
 bile,

“ bile, les matieres minerales veni-
 “ meuses, et les vins verds et aufteres,
 “ quoique differentes en apparence,
 “ produisent, malgré ce qu’ en peut
 “ dire M. Tronchin, des coliques à
 “ peu près de même espece.”

But to return to Dr. Huxham. — And
 first, how much soever our Cyder may
 agree with Rhenish and Moselle wines
 in the circumstance of containing a
 large quantity of essential salt, of a
 similar figure ; no argument, from ana-
 logy, will here be valid, unless it can
 be shewn that Rhenish and Moselle
 wines have ever produced the colic of
 Poitou in an unadulterated state *.

Secondly,

* Ce qu’ il y a de certain, c’est que la colique, dont il est
 question, a été epidemique dans les pays ou l’on boit des vins
 de

Secondly, if Cyder is the cause of this disease, as being an acid, why is the colic of Poitou very little known in the eastern countries, where the Turks, whose religion obliges them to abstain from wine, drink every day very large quantities of an acid sherbet? Does the experience of Jockeys, who, in order to reduce themselves to a certain standard of weight by sweating, are said to drink largely of vinegar, strengthen such an observation? Do we find it to be true, that children, and valetudinary people, and particularly chlorotic girls, whose *primæ viæ* abound with acid, are on that account subject to this colic? Is not a *Diar-*

de Rhin et de la Moselle. Ces vins pechent souvent par trop de verdeur; et les Marchands les ont long tems alterè avec la litarge. [Examen d'un livre qui a pour titre F. Tronchin de Colica Pictonum, par un medecin de Paris, p. 7.]

rhæa,

rhœa, or *Cholera*, the ordinary effect of eating unripe fruit immoderately? What reason can be given, why the poorer inhabitants of the counties of Worcester, Gloucester, and Hereford, who use, as their common drink, a weak acid cyder, are subject to no such colic? Why is this disease no longer endemic in the province of Poitou? Is it that the grapes are brought to more maturity, than they were formerly? Has the Sun more power now, than in the time of Citois? Why, in the Bahama-islands, is this disease unknown? I am informed by a gentleman, who lived there many years, that this has been the case, ever since rum has been no longer destilled in those islands. The same gentleman informs me, that the inhabitants drink

very

very large quantities of small punch, made extremely acid with the juice of limes ; the labouring people to the amount of two gallons of it every day. And lastly, is it reasonably to be suspected, that the essential salt of a vinous liquor can raise such tumults in the bowels, whether by corrupting the Bile, or otherwise ; when it is vulgarly known, even among the Miners in Derbyshire, that Patients, afflicted with this same disease, do not receive a more immediate, or a more important relief from any medicine whatever, than by taking large and repeated doses of this very essential salt, the *Cremor Tartari* ; and when it appears, that Dr. Hillary greatly depended on it for the cure of the dry-belly-ach in the West-Indies ? Zeller, in his *docimasia*,
D *signa,*

signa, causæ, & noxa vini lithargyrio mangonifati, gives an account of the revival of the adulteration of wine with litharge in the Duchy of Wirtemberg, in the beginning of the present century. In this dissertation he asserts, that though the wines, in the neighbourhood of Tubinga, were as acid as vinegar, the inhabitants had long drunk them with impunity, 'till this fraud was introduced. — “ *Constat viciniam*
 “ *nostram, ubi alias montes lachry-*
 “ *mantur, acetum, et istiusmodi vina*
 “ *immatura et acida per plures annos,*
 “ *imo lustra ab incolis & militibus*
 “ *largiter hausta fuerunt, ab omnibus*
 “ *tamen his symptomatibus penitus*
 “ *liberam fuisse, cum a fuco quoque*
 “ *libera fuerit: Imo in ipsa hac nostra*
 “ *Civitate, quæ ante duo lustra tru-*
 “ *culentia*

“culentia hac tantum non oppressa
 “fuit, postquam fraudem hanc plu-
 “rimi tam Vietores, quam Caupones,
 “teſte quidem exercuerunt, omnes
 “iſti, qui a Cauponibus vinum vel
 “non emerunt, vel in eorum ædibus
 “non biberunt, a torminibus et cru-
 “ciatibus hiſce immunes evaſerunt ;
 “licet eorum domeſtici per aliquot
 “annos auſterum & acidiffimum hau-
 “ferint vinum, ut acidius guſtari vel
 “dari nequeat ; aliis interea, quos
 “dulcedo inſcavit, miſerrime pa-
 “tientibus, aut enervatis, elumbibus
 “redditis, pendulis artubus et reſolutis
 “incédentibus, aut neci traditis ; plu-
 “rimi enim miſerrime perierunt.”

The experiment, mentioned by Zel-
 ler, proves nothing againſt the general
 wholeſomenefs of acids. Upon his

giving to a Dog three ounces and an half of very strong vinegar, the respiration of the animal immediately became sonorous and difficult; and he died in the third hour after he had swallowed the vinegar, having thrown up great quantities of froth, which at last was mixed with blood. The Dog being opened, no signs of inflammation appeared in the stomach: the mischief is described to have been in the lungs only. Some of the vinegar probably found its way into the lungs; and suffocation seems to have commenced in the very act of swallowing. Whereas Brunnerus, (*Ephemerid. Germanic. an. 4. observat. 92.*) who killed a Dog with an ounce of powder of litharge, dissolved and boiled in vinegar, found the effects of that poison to be principally

pally in the stomach, intestines, urinary bladder, and the rest of the *viscera* of the *abdomen*.

I shall only add one more observation concerning acids. Physicians, who have resided some time in the hotter countries, have testified, that there are no better remedies against spasms, dysenteries, and the other endemial diseases in hot climates, than the acid vegetables, with which Nature has most liberally supplied the warmer countries. This opinion is expressed in a strong manner by Jacobus Bonnius in his *Historia Naturalis Indiæ Orientalis*, lib. vi. cap. 27. “ Videtur
 “ Natura voluisse ex professo multas
 “ acidas et constringentes herbas e
 “ terra producere contra violentos &
 “ endemios morbos, dysenteriam nem-
 “ pe,

“ pe, choleram, & spasmus, plerum-
 “ que a Bile ortos : ut quasi digito
 “ monstraret, ubi hæc vel similia mala
 “ nascuntur, ibi locorum remediorum
 “ manifesta et etiam occulta qualitate
 “ pugnantium penuriam non fore.”

It seems therefore not to have been
 without sufficient foundation, that I
 have for some time suspected, that the
 cause of this Colic is not to be sought
 for in the pure Cyder ; but in some,
 either fraudulent, or accidental, adul-
 teration.

Upon inquiry, I find that the disease
 is very common all over the county of
 Devon ; but that it particularly infests
 those parts of the county, where the
 greatest quantities of Cyder are made.
 I likewise find that it is not only com-
 mon among the lower class of inhabi-
 tants,

tants; but that it is much more frequent among people of all ranks, than in other parts of England; and that it is not intirely confined to the autumnal season. Not long ago I had an opportunity of seeing several wretched victims to this cruel disease; who answered to the representation drawn by Citois. “ Per vicos, veluti larvæ,
 “ aut arte progredientes statuæ, pallidi,
 “ squallidi, macilenti conspiciuntur,
 “ manibus incurvis et suo pondere
 “ pendulis, nec nisi arte ad os et cæte-
 “ ras supernas partes sublatis, ac pe-
 “ dibus non suis, sed crurum musculis,
 “ ad ridiculum, ni miserandum, in-
 “ cessum compositis, voce clangosa &
 “ strepera.”

I lately received from Dr. Andrew of Exeter the following account of

all the Patients, under this disease, admitted into the hospital at Exeter since September 1762.

From Sept. 1762 to Sept. 1763 — 72

Sept. 1763 to — 1764 — 75

Sept. 1764 to Lady-Day 1766 — 86

Lady-Day 1766 to July 6, 1767 — 52

285

Of this number 209 were cured.

Dr. Andrew likewise informs me, that Patients are brought to the Exeter hospital from all parts of the county; but chiefly from those parts, where most cyder is made.—That the most violent symptoms of this disorder, such as pain and costiveness, are generally removed, before the sick are brought to the hospital; and that nothing commonly remains but a paralytic weakness

ness in the arms. Dr. Andrew adds,
 “ I have known this complaint cured
 “ radically ; tho’ I confess, a return
 “ often happens. When the disease
 “ proves obstinate, we always endea-
 “ vour to get our Patients into the
 “ hospital at Bath ; the Bath-water,
 “ tho’ not a specific, being esteemed
 “ by us the most effectual reme-
 “ dy, both internally and externally
 “ used.”

According to my information, eighty
 Patients, under the effects of the De-
 vonshire colic, were admitted into the
 Bath-hospital in the course of the last
 year ; forty of whom are said to have
 been cured, and thirty-six sent away
 greatly relieved. I likewise am in-
 formed from the Bath-hospital, that
 the proportion of such Patients from

Devonshire, to that from the counties of Hereford, Gloucester, and Worcester, is generally as eight to one.

In some letters, which I have lately received from Dr. Wall, of Worcester, the following facts are mentioned.

“ The counties of Hereford, Gloucester, and Worcester, are not, so far as I know, subject to the colic of Poitou, or any other endemic illness, unless it may be the rheumatism; which, I think, the inhabitants of Herefordshire are more liable to, than those of some other counties. There is no Lead, which can give occasion to that colic, used in any part of the *apparatus* for grinding or pressing the apples, or fermenting the liquor. Once indeed, in a plentiful year of apples, I knew a Farmer, who

“ who, wanting casks, filled a large
 “ leaden cistern with new cyder, and
 “ kept it there, till he could procure
 “ hogsheds sufficient to contain the
 “ liquor. The consequence was, that
 “ all who drank of it were affected by
 “ it as the Lead-workers usually are:
 “ We had eleven of them, at one
 “ time, in our Infirmary.

“ I have lately had two or three
 “ Patients in that distemper, occa-
 “ sioned by their having drunk cyder
 “ made in a press covered over with
 “ Lead. But this fact of a cyder-press
 “ covered with Lead, is a singular, and
 “ perhaps the only instance of the
 “ kind in this part of England. It
 “ happened in a part of the county of
 “ Worcester, adjoining to Warwick-
 “ shire, where very few apples grow ;
 “ and

“ and the bed of the press being there-
 “ fore cracked by disuse, the sagacity
 “ of the Farmer contrived this cover-
 “ ing, to prevent a loss of his liquor.
 “ In general, the cyder-drinkers with
 “ us are healthy and robust; but for
 “ the most part lean. The liquor is
 “ clear, and passes off readily by urine
 “ and perspiration; which enables the
 “ common people to drink immense
 “ quantities of it when at labour, to
 “ the amount of several gallons in a
 “ day. I have heard it observed by a
 “ Physician, late of this place, who
 “ was much concerned in the cure of
 “ Lunatics, that more of those unhappy
 “ Persons came to him from Hereford-
 “ shire, than any other place. The fact,
 “ if true, may possibly arise from the
 “ quantity drunk, rather than the qua-
 “ lity.”

Were

Were the *apparatus* for making cyder the same in all the cyder-counties, it would appear very remarkable, that the inhabitants of one county should experience such terrible effects from the use of this liquor, while those of the other counties drink it with impunity. But, if we inquire into the method of making cyder in the county of Devon, we shall be able to conjecture with some degree of probability, what it is that occasions such a difference. The large circular trough, in which the apples are ground, is generally composed of several pieces of moor-stones, cramped together with iron, some melted Lead being poured into the interstices. It frequently happens, that these stones, which are thus to be joined, are unequal, and do not correspond

correspond with each other; so that considerable chasms are left between them; and these chasms are filled up with Lead. In this case the apples, ground by the pressure of the roller, immediately come in contact with no small quantity of this poisonous mineral.

It is likewise common, in several parts of the county, either to line the cyder-presses entirely with Lead, in order to prevent their leaking; or to make a border of Lead quite round the press, in order to receive the juice of the apples, and to convey it into a vessel, made of wood or stone, placed underneath. And in many other places, where these methods are not used, it is common to nail sheet-lead over any cracks or joints in the presses; and likewise to convey the juice of the apples

from the presses in leaden pipes. Moreover I am informed, that it is the practice of some Farmers, in managing their weak cyder, made early in the year, before the apples are ripe, to put a leaden weight into the casks, in order to prevent the liquor from growing sour ; and that this cyder is the common drink of their servants and labourers. But I am willing to believe, that this pernicious method of adulteration (against which severe laws have been enacted, as well in France as in Germany, and which crime, in both countries, is deservedly punished by death) is not often practised by our countrymen.

Dii meliora piis, erroremque hostibus illum!

Dr. Wall informs me, that in some parts of the counties of Hereford, Gloucester,

Gloucester, and Worcester, the mills, in which the apples are ground, being 16, 18, or 20 feet in diameter, consist of several pieces of stone or timber, joined together with cramps of iron, fastened with Lead: but that these cramps are fixed in the *bed* of the mill, or on the outside of the curb, and not in the groove where the apples are ground. The same Gentleman observes, that, if many apples, full of juice, lie long on the *bed* of the mill, (where the apples are placed in an heap, that they may be ready to be thrown into the groove,) some of which may perhaps be rotten, others bruised in the gathering, and a moisture spread over the whole, from the fermentation and sweating of the fruit, it may perhaps be doubted, whether

ther some part of the Lead, used in the cramps, may not be dissolved; tho' it must be, at most, in a quantity extremely small; there being but very little Lead used in the junctures; and the surface exposed to the apples being almost imperceptible. But I am informed by another person, that in many parts of Herefordshire, and the neighbouring counties, the stones of the mills, are joined together with putty; (which is whiting, mixed with oil into a tough paste) and that neither iron nor Lead are originally used in the construction of them; but that, if any of the joints, in wearing, happen to start (which is sometimes the case) they are repaired with iron cramps fastened with lead.

These facts having been well ascertained, I determined to make use of

the first opportunity, which might occur, of informing myself by experiment, whether or no there are really marks of a solution of Lead in the cyder of Devonshire. Being therefore, in the month of October 1766, at Exeter, I procured some of the expressed juice of apples, as it flowed from a cyder-press, lined with Lead, in the parish of Alfington. On this I made and repeated several experiments by means of the *atramentum sympatheticum*, or *liquor vini probatorius* described by *Neuumann*; and of the volatile tincture of sulphur. These experiments intirely satisfied me, that the Must contained a solution of lead. The same experiments were made on some cyder of the preceding year. This likewise shewed evident signs of lead contained in it; but in less proportion than in the Must.

But,

But, being unwilling to make any positive assertion, solely on the authority of my own trials, more especially as I had been under the influence of a preconceived opinion; I brought with me to London some of the same Must, which I had examined at Exeter. This Must, together with some Devonshire cyder of the preceding year, which I purchased of the maker, (who assured me that he used no Lead in any part of the *apparatus* for making cyder, except only what is necessary for composing the trough, as was mentioned above,) were the subject of some experiments, in making which, Dr. Saunders, an ingenious Gentleman, who teaches Chemistry, kindly gave me his assistance.

Before I give an account of the several experiments, which we made, in

order to ascertain this adulteration, it may be proper to make a few observations, which will perfectly explain the mode of union, which takes place between wine, or cyder, and lead.

The expressed juice of the grape, or of the apple, has a considerable quantity of acid united with the saccharine matter. This juice, when subjected to fermentation, has its acid, during the progress of that fermentation, gradually assimilated and converted into an alcohol or inflammable spirit. But if the original juice, or Must, be crude and acid, without having much saccharine matter in it, the native acid is with difficulty assimilated; or, when it arrives at the proper period of assimilation, it does not remain there stationary, but hastens on to the acetous
fer-

fermentation. When lead is added to such wines, their acidity is covered; a sweetness is communicated to them; and their acetous fermentation is checked.

The richer wines, of which the original juice contains a large proportion of saccharine matter, are less liable to adulterations of this kind, than the poorer wines of northern climates, such as the Rhenish and the Moselle wines, and our English cyder.

It is here to be observed, that the vegetable acid, either in its native state of Must, or in its fermented state of vinegar, or in its intermediate state of cyder, very readily receives an impregnation from Lead, whether it be applied in its metallic or calcined state. We are therefore to consider Lead, when
united

united with wines, as in the condition of *saccharum Saturni*.

By attentively observing the variety of changes produced by certain bodies, when added to a solution of *saccharum Saturni*; and by applying these observations to the wines, which are the most frequent subjects of this adulteration, Chemists have been enabled to detect such frauds, wherever they have existed.

EXPERIMENT I.

A small quantity of Devonshire cyder being exposed upon clean paper to the fumes of the volatile tincture of sulphur, became immediately of a darkish colour, approaching to black. And we could only imitate this colour by exposing a dilute solution of *saccharum Saturni* to the

the same fumes. A small quantity of cyder, made in the county of Hereford, exposed in like manner to the same fumes, exhibited no such appearance, until a few drops of a solution of *Saccharum Saturni* were added to it.

OBSERVATION. I.

From this experiment we are to understand that the acid, before united with the Lead in the cyder, and the volatile alkali in the tincture of sulphur, mutually attracted each other; and that it was the precipitate of the Lead united with the sulphur, which produced the dark colour above-mentioned.

EXPERIMENT II.

A small quantity of *Hepar Sulphuris* prepared by digesting together in a sand-

sand-heat one ounce of orpiment, and two ounces of quick-lime, with twelve ounces of water, in a close vessel) being added to some Devonshire cyder, in a few minutes occasioned a darkish colour in the body of the liquor, approaching to black; and the whole became very opake. No such change was produced in the cyder of the county of Hereford, until a few drops of a solution of *saccharum Saturni* were added; when the same appearance, which was produced in the Devonshire cyder, was perceived.

OBSERVATION II.

The reasoning, made use of in the former observation, is applicable here. The decomposition of the *saccharum Saturni* and of the *Hepar Sulphuris* was

was effected by the same laws of elective attraction.

EXPERIMENT III.

To a small quantity of Devonshire cyder a few drops of *Hepar Sulphuris* (prepared by boiling equal parts of fixed vegetable alkali and sulphur together in water) were added; and a precipitation of a very dark colour was produced.

When some Herefordshire cyder was treated in the same manner, the precipitate produced was as white as milk; and it was only upon the addition of a few drops of a dilute solution of *saccharum Saturni*, that a precipitate of the same colour with the former could be obtained.

OBSERVATION III.

There is some nicety required in making this experiment. The *Hepar Sulphuris* is not to be added in any large quantity ; for as all the lead is precipitated upon the first addition, it is easy to perceive the several successive shades of colour in the precipitate, until all the lead is separated ; and then the precipitate, upon a farther addition of *Hepar Sulphuris*, assumes the whiteness of the precipitate obtained from the Herefordshire cyder, which intitles it to the appellation of *Lac Sulphuris*. If a large quantity of *Hepar Sulphuris* be at once added, the whiteness of the too copious precipitate is such, as to render the dark colour of what is first precipitated imperceptible.

EXPERIMENT IV.

Some Devonshire cyder was examined by means of the volatile tincture of sulphur, as in Experiment III. A very dark coloured precipitate was obtained. A similar precipitate could only be obtained from Herefordshire cyder, after that a weak solution of *saccharum Saturni* was added to it.

Some of the Must (taken from the press in the parish of Alfington, as was mentioned above) treated in the same manner with the cyder, produced precipitates of a deeper black colour. This sufficiently shews, that the solution of Lead in the Must was stronger than that in the cyder.

It is a matter of no consequence, whether the Lead, the existence of

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which

which is proved, was applied to the cyder in its state of Must, or in that of a vinous liquor. However, as the must afforded more considerable signs of impregnation than the cyder, it would seem probable that the lead was added to the Must; and that, as the acid, during the fermentation, is in a great measure converted into alcohol, a proportional quantity of lead will consequently be precipitated.

The same experiments were afterwards tried on several other specimens of Devonshire and of Herefordshire cyder. The result of them was constantly and uniformly the same as has been described.

It has been proposed by several Authors, to detect such adulterations of wines by means of the vitriolic or of the

muriatic acid ; which, by uniting with the lead, will make it precipitate. But it is ascertained by the experiments, made by Profeffor Gaubius, that trials, made with the acids, are lefs conclusive than thofe which have been defcribed.

EXPERIMENT V.

In order to leave the matter entirely without doubt, an extract from 18 common quart bottles of Devonshire cyder (firft ftrained through a cloth) which had been in my cellar more than three months, was prepared. This extract, being affayed with the black flux, a quantity of Lead, weighing four grains and an half, was found at the bottom of the crucible. Thefe experiments were made in October 1766.

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In the latter end of the last century, when the physicians of Germany (particularly Vicarius, Cockelius, and Brunnerus, whose dissertations on this subject may be found in the *Ephemerides Germanicæ*) had taken great pains to discover the true cause of the epidemic colic, which, to use the language of Brunnerus, (*Ephemerid. Germanic. Dec. 3. an. 4. observat. 92.*) “non
 “minus ægrotantium viscera, quam me-
 “dientum animos, torferat;” And when they had at last demonstrated, that this disorder was wholly to be referred to small acid wines, adulterated with litharge, there appeared a writer (a certain Seerup, a physician of Copenhagen) who endeavoured to exhibit a specimen of his reading and ingenuity, by maintaining a bold paradox. This
 man,

man, in very pompous language, and with an air of the greatest confidence, asserted in his *triumphus lithargyriatorum*, that no danger was to be apprehended from wines in which litharge was dissolved; and that all the ill effects, supposed to have been derived from that cause, were really to be attributed to the austere acid of wine made of unripe grapes. This opinion he endeavours to defend by the authority of Drawitzius, Sennertus, Van Helmont, Theodorus Zwinger, Boyle, Wepfer, and several other Writers. He likewise quotes several authors, to shew the salutary effects produced in the human body by the internal use of lead; and insists, in virtue of their testimony, that it had cured affections of the spleen, arising from an acid cause; the

hypochondriacal disease; sudden inflammations; colics occasioned by the *Bilis æruginosa*; obstinate quartan fevers; ulcerations of the lungs, as well as of other parts; and the plague itself. He adduces other authorities to shew, that the *Aqua Saturni* had been of very great use in disorders occasioned by worms; that the *Spiritus Saturni* had cured the leprosy; that Paracelsus held it to be a specific remedy in madness; and that in the small-pox, and all other inflammations, it had been proved to be an efficacious medicine: That it was the great sudorific medicine of Faber; and that it was Mynsicht's secret for the cure of the *phthisis*, and diseases of the spleen and colic; and that the great success, which had attended the practice of

Petrus

Petrus Matthias was to be ascribed to the use of *Saccharum Saturni*, and other preparations of lead : and lastly, that a constipation of the belly could not justly be attributed to *Saccharum Saturni*, since Antonius de Heide asserts, in his medicinal observations, that he cured that disorder by administering to his Patients five grains of that remedy, mixed with Crabs-eyes.

It is presumed that, the presence of lead in the Cyder of Devonshire being demonstrated, there is no one, at this time of day, likely to revive the argument of Seerup, and still insist on the deleterious quality of the acid : For a poison is discovered, which is experimentally known to be adequate to all those dreadful effects, so pathetically described by Dr. Huxham. It is like-

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wife presumed that no opinion, unsupported by facts and experience, (how respectable soever the character of its author may be) will be admitted in evidence, when contrasted with the authority of a fact, which seems to be clearly demonstrated to our senses.

The general character of lead, and the preparations of lead, when given internally, has been, that they cool, incraffate, repel, absorb, and obtund acrimony. And it is very well known, that their real power has, in many instances, seemed to answer to such a general character; for there are scarcely any medicines, which produce their effects more immediately, or with greater certainty, in colliquative sweats, in fluxes and in hæmorrhages. But it is as well known

known, that the relief given, which, for the most part, is only temporary, has been frequently followed by violent pain in the bowels, obstinate costiveness, suppression of urine, tremors, spasms, palsy, asthma, and suffocation. And altho', if we give credit to the testimony of credible writers, we must allow that Patients, of certain constitutions, may have taken these medicines with success, and with impunity; yet surely Physicians cannot be too cautious in avoiding the use of medicines, the effect of which, for aught that they can presume to ascertain, may be more formidable than the diseases to which they are opposed. That preparations of lead were formerly very fashionable medicines, we may judge from the oldest dispensatories,

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ries, in which we find an almost infinite number of Magisteries, Elixirs, and Balfams, which have that metal for their *basis*.

We are informed by Mr. de Haen, that the use of these medicines is much more common even now than is generally imagined. He thinks that the number of Patients, affected by the colic of Poitou, is immensely increased by such means. He mentions the *formula* of a medicine, compounded of ℥i of *Saccharum Saturni*, ʒi of Cerusse, and ʒvi of water. By this medicine taken *cocbleatim*, a Patient, he says, was cured of a *gonorrhœa*; but soon afterwards was seized with the most excruciating pain in his bowels, followed by a vomiting of his excrements. He adds, that this man,

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who' he escaped death, even after three years, felt and lamented the reliques of that most dreadful cure. I could quote from my own experience more than one instance of cases, in several respects similar to this, which I have taken from Mr. de Haen's *ratio medendi*.

What then can we think of the practice of the Chinese, who very frequently administer internally various preparations of lead, to which they ascribe extraordinary virtues? The observation made on this subject by Mr. Malouin, in his *Chymie Medicinale*, seems judicious. “ En réfléchissant sur l'usage interieur que les Chinois font du Plomb, on est porté à croire que ces peuples sont differemment
“ construits

“ construits ou tempérés ; ou que leur
 “ Plomb differe du nôtre.”

Dr. Huxham finds it a difficulty to account for the reason, “ why the juice of apples in one year produces a costive belly, with violent colical pains, but in another, a loose belly with scarce any gripes attending.” I have been informed by others, that small quantities of new cyder will frequently produce a *diarrhœa* in every year. But Citois observes, that the colic, which infested the inhabitants of the province of Poitou, was often attended, “ per
 “ initia præsertim, cum alvi frequenti,
 “ sed non ita copioso, fluore, sæpius
 “ cum ejusdem adstrictione.” M. Douzam, who writes on this disease in the *journal de medicine* for the month of October, 1760, affirms that “ Il en
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“ est plusieurs, qui non seulement
 “ n’ont point éprouvé de constipation,
 “ mais même qui se sont plaints d’un
 “ flux de ventre.” The same thing
 is sometimes observed in the case of
 painters, and of other workmen em-
 ployed about Lead. Some of them
 are cured by a spontaneous looseness
 of the belly. Mr. James Wilson,
 who (in the *Essays and Observations*
physical and literary, published at
 Edinburgh, Vol. 1. Art. 22.) gives an
 account of a disease, called by the
 miners *Mill-reck*, which all the in-
 habitants of *Lead-Hills* are subject to,
 but particularly those, whose daily
 business it is to melt down the Lead,
 observes, that, in the first stage of this
 disease, a diarrhœa sometimes makes
 a cure.

A question

A question may be asked, “ If the
 “ mischiefs occasioned by Cyder, par-
 “ ticularly when it is new, arise from
 “ the poison of lead dissolved in it,
 “ how happens it, that all, who drink
 “ this liquor, do not suffer in propor-
 “ tion to the quantity of poison swal-
 “ lowed ; and that some people, who
 “ have long accustomed themselves
 “ to it, have never experienced any
 “ of its bad effects ? ” This dif-
 ficulty, (which is in its full force,
 whatever general cause be supposed)
 can only be solved by recurring to that
 inexplicable *idiosyncrasia*, in which
 there is so remarkable a difference
 among men. But it is likewise to be
 remembered, that the Physicians of
 Germany, who, in the latter end of
 the last, and in the beginning of the
 present

present century, wrote concerning wine adulterated by litharge, and the general effects of it, made the same observation. The words of Zeller are, “ Multi tamen, imo innumeri ab eo læsi non fuerunt, utut ad ebrietatem usque illud hauserint ; alii leviter tantum.”

I shall only add, that it will not be easy to determine the exact quantity of lead dissolved by the acid of Cyder, unless an evaporation and an assay be made, as soon as the juice is expressed. For it seems probable, that, as it happened in the case of the adulterated wines of Germany (which, we are informed, after a few months, lost that apparent, but pernicious improvement, which fraud had given them) the Cyder may, in some time, deposit
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the greatest part of its poison. But that a very small quantity of this poison is capable of producing most terrible effects, is certain from what was formerly observed in Germany. For a calculation having been made, according to the method of adulterating wines which is described by Cockelius, a measure of wine, called the *mensura Wirtenburgica major*, (which Reifelius estimates at sixty-four ounces) scarcely contained one half of a grain of litharge.

May not I presume to hope, that the present discovery of a poison, which has for many years exerted its virulent effects on the inhabitants of Devonshire, incorporated with their daily liquor, unobserved, and unsuspected, may be esteem-

d by those, who have power, and who have opportunities to remove the source of so much mischief, to be an object worthy of their most serious attention? I have long lamented, that a County, which distinguished by some peculiar blessings, should likewise be distinguished by a peculiar calamity, as it were in consequence of its fertility. The subject therefore having appeared to me important, I have spared no pains in this investigation; and I am insured of my reward by the consciousness of having endeavoured to preserve my countrymen and fellow-creatures from one of the most dreadful diseases, incident to the human body.

This essay will probably be hereafter published in a medicinal collection. Some copies of it are now printed, with a particular

ticular view of giving to the inhabitants of the county of Devon the earliest intimation of their danger ; in order that they may take the proper steps to preserve their health, and to secure the value of their property.

F I N I S.